



**DIGITAL VIDEO MULTIPLEXER II
(DVM II)**

INSTALLATION GUIDE

Notice: Amdek Corporation reserves the right to make improvements in the product described in this manual at any time and without notice.

Copyright Notice: This manual is copyrighted. All rights are reserved. This document may not, in whole or part, be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine readable form without prior consent, in writing, from Amdek Corporation.

© 1983 by Amdek Corporation
2201 Lively Blvd.
Elk Grove Village, IL 60007

ONE YEAR WARRANTY

Amdek Corporation warrants this product against defects in material and workmanship, as follows:

1. For a period of one year from the date of purchase, Amdek will pay the labor charges of your authorized Amdek service facility to repair the defective product.
2. In addition Amdek will supply, at no charge, new or rebuilt replacements for the defective parts for a period of one year from the date of purchase.

Labor and Parts

To obtain warranty service during the one year period, you must take the product, or deliver the product prepaid, to the authorized Amdek service facility.

Any defective part will be replaced if it is taken, or delivered prepaid, to an authorized Amdek service facility or Amdek factory service center, at your expense.

This warranty does not cover damage due to accident, misuse, abuse or negligence.

We suggest that you retain the dealer's dated bill of sale as evidence of the date of purchase.

REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE CONSUMER. AMDEK SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ON THIS PRODUCT. EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ON THIS PRODUCT IS LIMITED IN DURATION TO THE DURATION OF THIS WARRANTY.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

For the name of your nearest authorized Amdek service facility or Amdek factory service center, call (312) 364-1180 or write Amdek Corporation.

AMDEK CORPORATION
2201 Lively Blvd., Elk Grove Village, IL 60007

DIGITAL VIDEO MULTIPLEXER

INSTALLATION AND OPERATION MANUAL

CONTENTS

1.0 Description	3
2.0 Installation of DVM II	3
2.1 Checkout Procedure	5
2.2 Adjustment	6
3.0 Operation	7
3.1 Appendix A, DVM II Address Tables	8
3.2 Appendix B, 80 Column Board Option A	10
3.3 Appendix C, Background Information on Monitors	11

FIGURE INDEX

Figure 1. DVM II Analog/Digital Monitor Pre-Select	4
Figure 2. DVM II Board Layout	4

TABLE INDEX

Table 1. Available Colors Per Monitor Type And Resolution	6
Table 2. DVM II Hexadecimal Addresses	8
Table 3. DVM II Integer Decimal Addresses	8
Table 4. DVM II Floating Point Decimal Addresses	9
Table 5. DVM II Integer CP/M Addresses	9
Table 6. 80 Column Card Connection Points	10

1.0 DESCRIPTION

The Digital Video Multiplexer II (DVM II) is an RGB video output interface board for the Apple II and Apple II+ personal computers. The board measures approximately 3" high and 10" long and can be plugged into any expansion slot of the computer. The DVM II supplies either positive or negative polarity composite sync (CSYNC) for use with digital monitors such as the Amdek Color II (positive) or Amdek Color II+ (negative).

FEATURES

The DVM II features a new mode in high resolution graphics which provides pure white graphics characters. By allowing the color guns to project only red, blue, and white, the green and magenta tones in white characters can be eliminated.

The DVM II also provides these additional features:

- 16 Low Resolution Apple Colors
- Expansion Slot Independent
- 80 Column Card Compatible*
- All Apple II Normal Modes
- All White High Resolution
- Color Gun Selectable for Single Color Text

*Note The 80 column card must provide RS-170 output.

2.0 INSTALLATION

Included in the DVM II package are the following:

- 1) DVM II interface board
- 2) 2 RCA connector cables
- 3) 1 video monitor connector cable
- 4) DVM II installation guide

If you are missing any of the above parts, please contact Amdek Corporation at the address or phone number listed on page 1.

- 1) The DVM II will operate with either a positive or a negative polarity composite sync digital monitor. The monitor type will dictate which polarity sync is required. The DVM II is preset to negative CSYNC and can be changed if needed. CSYNC polarity is set using a jumper wire located in the upper right corner of the DVM II as shown in Figure 1. To change the polarity to positive, remove the wire connection at point C solder it to point B. To change back to negative CSYNC, disconnect the wire at point B and solder it to point C.
- 2) Plug the RCA connector cables onto the DVM II before installation. Apple video output connects to J2, and an 80 column card, if installed, connects to J1 as shown in figure 1.
- 3) Switch off the Apple II and be sure to unplug the power cord. Remove the top cover and lay it aside.

SOLDER JUMPER AT A - B
FOR POSITIVE CSync

SOLDER JUMPER AT A - C
FOR NEGATIVE CSync

The diagram illustrates the internal circuitry of the Apple II+ expansion slot. Key components and their connections are as follows:

- Expansion Slot Pins (1-16):** The top edge of the slot has 16 pins. Pins 1-10 are labeled 1 through 10 from right to left. Pins 11-16 are labeled 11 through 16 from left to right.
- Video Output Buffer (J3):** A 74LS161 buffer is connected to pin 1. Its output is connected to pin 2. The buffer is labeled J3.
- Video Preselect Switch (S1):** A switch labeled S1 (APPENDIX B) is connected to pin 3. It has two positions, A and B. Position A is connected to pin 4, and position B is connected to pin 5.
- Video Amplifier (R5):** A resistor labeled R5 (AMPLIFIER GAIN) is connected to pin 6. Its output is connected to pin 7.
- Video Output Driver (J1):** A 74LS161 buffer is connected to pin 8. Its output is connected to pin 9. The buffer is labeled J1.
- Internal Circuitry:** The diagram shows a complex network of logic gates and buffers. Key components include:
 - 74LS161:** A 4-bit binary counter used for video output buffering.
 - 74LS164:** An 8-bit shift register used for video output buffering.
 - 74LS165:** An 8-bit parallel data loader used for video output buffering.
 - 74LS166:** A 4-bit binary counter used for video output buffering.
 - 74LS167:** A 4-bit binary counter used for video output buffering.
 - 74LS168:** A 4-bit binary counter used for video output buffering.
 - 74LS169:** A 4-bit binary counter used for video output buffering.
 - 74LS170:** A 4-bit binary counter used for video output buffering.
 - 74LS171:** A 4-bit binary counter used for video output buffering.
 - 74LS172:** A 4-bit binary counter used for video output buffering.
 - 74LS173:** A 4-bit binary counter used for video output buffering.
 - 74LS174:** A 4-bit binary counter used for video output buffering.
 - 74LS175:** A 4-bit binary counter used for video output buffering.
 - 74LS176:** A 4-bit binary counter used for video output buffering.
 - 74LS177:** A 4-bit binary counter used for video output buffering.
 - 74LS178:** A 4-bit binary counter used for video output buffering.
 - 74LS179:** A 4-bit binary counter used for video output buffering.
 - 74LS180:** A 4-bit binary counter used for video output buffering.
 - 74LS181:** A 4-bit binary counter used for video output buffering.
 - 74LS182:** A 4-bit binary counter used for video output buffering.
 - 74LS183:** A 4-bit binary counter used for video output buffering.
 - 74LS184:** A 4-bit binary counter used for video output buffering.
 - 74LS185:** A 4-bit binary counter used for video output buffering.
 - 74LS186:** A 4-bit binary counter used for video output buffering.
 - 74LS187:** A 4-bit binary counter used for video output buffering.
 - 74LS188:** A 4-bit binary counter used for video output buffering.
 - 74LS189:** A 4-bit binary counter used for video output buffering.
 - 74LS190:** A 4-bit binary counter used for video output buffering.
 - 74LS191:** A 4-bit binary counter used for video output buffering.
 - 74LS192:** A 4-bit binary counter used for video output buffering.
 - 74LS193:** A 4-bit binary counter used for video output buffering.
 - 74LS194:** A 4-bit binary counter used for video output buffering.
 - 74LS195:** A 4-bit binary counter used for video output buffering.
 - 74LS196:** A 4-bit binary counter used for video output buffering.
 - 74LS197:** A 4-bit binary counter used for video output buffering.
 - 74LS198:** A 4-bit binary counter used for video output buffering.
 - 74LS199:** A 4-bit binary counter used for video output buffering.

4

- 4) For explanation purposes, we will install the DVM II into slot 2. Align the DVM II board over the chosen slot and push firmly down into the slot. Maintaining downward pressure "rock" the DVM II from front to back to insure complete insertion. Check that the DVM II is not tipped towards the extended part of the board as incorrect operation and possible damage may occur to the DVM II or the Apple II.
- 5) Connect the other end of the RCA cable from J2 to the video output of the Apple II.
- 6) If there is an 80 column card, connect the other end of the RCA cable from J1 to the 80 column card.
- 7) Connect the video cable to J3, the ribbon cable connector, as shown on Figure 2. The other end of the ribbon cable is furnished with a 9 pin connector to the video monitor.
- 8) Extend the video connector cable through the back of the case. Reposition and replace the cover of the Apple II.

2.1 CHECKOUT PROCEDURE

After the above steps are completed, the system is ready for checkout. The following short programs may be used to check the features of the DVM II.

Low-Resolution mode

This program will test the lo res and text settings. The text window will be visible when in graphics mode.

```
10 GR
20 FOR Y = 0 TO 31
30 COLOR = INT (Y/2)
40 VLIN 0, 39 AT Y + 4
50 NEXT Y
```

This program will display low resolution colors in the order of 0-15 as shown in Table 1 on the following page. Note the color differences depending on monitor type. A monitor such as the Amdek Color II will display digital colors only. A different type monitor such as the Amdek Color II+ will display analog colors. A brief discussion of this difference is included in Appendix C.

TABLE 1
Available Colors Per Monitor Type and Resolution*

Color No.	Digital Colors		Analog Colors	
	Low Res	High Res	Low Res	High Res
0	Black	Black	Black	Black
1	Red	Green (1) (2)	Magenta	Green (1) (2)
2	Green	Magenta (1) (2)	Dark Blue	Magenta (1) (2)
3	Yellow	White	Purple	White
4	Blue	Black	Green	Black
5	Magenta	Red (2)	Grey	Red (2)
6	Cyan	Blue (2)	Med. Blue	Blue (2)
7	White	White	Light Blue	White
8*	Black		Brown	
9*	Red		Orange	
10*	Green		Grey	
11*	Yellow		Pink	
12*	Blue		Green	
13*	Magenta		Yellow	
14*	Cyan		Aqua	
15*	White		White	

*Intensified, (1) = White in mode 2, (2) = White in mode 3

High Resolution Mode

The program below checks the High-Resolution graphics in the full page mode:

```

10 HGR
20 POKE - 16302, 0
30 FOR X = 0 TO 279
40 HCOLOR = INT [(X + 40)/40]
50 HPLOT X, 0 TO X, 191
60 NEXT X

```

This program fills the screen with high resolution color bars. The colors will cycle in the order 0-7 as shown in Table 1 above. Note that in high resolution mode, there is no difference 0-7 between digital and analog monitor colors. If problems occur, turn to the Adjustment Procedures section for possible solutions.

2.2 ADJUSTMENT PROCEDURE

DVM II

The video signal controlled by R11 at the Apple II motherboard coordinants J-14, should be full ON. Adjust R11 full clockwise. The amplifier gain on the DVM II card (R5 as shown on Figure 2) should be adjusted full clockwise. Fill the screen with hi res graphics. If "flickering" exists, turn the Apple II video adjustment (R11) counterclockwise until the flickering stops. This procedure should give satisfactory results in most cases, however, depending on the Apple II in use and the other extension cards present, further fine adjustment may be necessary.

80 Column Card

The preceding adjustment will usually result in good 80 column display. Some 80 column cards have individual adjustment of the video signal. In most cases turning the video signal adjustment to full ON will give best results with these. If problems persist with the display of text, turn to Appendix B for an optional connection to the 80 column card.

3.0 OPERATION OF THE DVM II

The DVM II is a TTL RGB interface card made specifically for the Apple II. The card may be plugged into any of the expansion slots of the Apple II, (see Installation, step 4), so there is no requirement of having the DVM II and another board operating out of the same slot. The functioning of the DVM II is controlled by software switches that are slot dependent, and the addresses of these software switches for all slot positions are tabled in Appendix A. The tables include addresses in hexadecimal, integer decimal, floating point decimal, and for use with CP/M.

Colored Text (Low Resolution Mode)

With the DVM II, the red (bit 0), green (bit 2), blue (bit 1) and intensity (bit 3) lines can be turned on/off at the users discretion. For example, if the user would want to simulate a green phosphor screen he would turn off the red and blue switches. To do this the correct switch address must be found in Appendix A. (We will again assume the DVM II is plugged into slot 2 for the following examples.) A check in Table 4 of Appendix A, gives the floating point addresses of 49313 for red and 49317 for blue. The following statements will then turn off red and blue leaving a green text:

```
POKE 49313, 0 (turn off red)
POKE 49317, 0 (turn off blue)
```

Depending on type of monitor used, there are a total of 16 possible colors for text. These are described in Table 1. The intensity switch controls the intensity of the video. When turned off with POKE 49325, 0, the video display will darken. In text mode (low res), use of the Intensity switch will yield an additional 8 colors.

80 Column Card Operation

The output of an 80 column card can be plugged into J1 of the DVM II and displayed. In this case the 80 column card must be turned on and the DVM II will have to be shifted to the 80 column mode. A check of the tables in Appendix A provides the DVM II ON and OFF addresses (remember the DVM II is in slot 2 for our discussion).

```
POKE 49319, 0 (80 column ON)
POKE 49318, 0 (80 column OFF)*
```

**An easier way to exit is to press RESET.*

High Resolution Graphics

There are 3 hi res modes available with the DVM II. The first one is the normal hi res mode colors of black, green, magenta, white, red, and blue. (The 3 high resolution color modes are outlined in Table 1).

With POKE 49321, 0, the DVM II is placed in the second mode. In this mode green and magenta are changed to white. This mode is especially useful when using a character generator and the screen is a little too colorful to read.

With POKE 49323, 0, the third mode in hi res is entered. In this mode all colors are turned to white for a hi res monochrome display.

TABLE 2
Hexadecimal Addresses

Condition To Set	Expansion Slots							
	0	1	2	3	4	5	6	7
Red ON	C080	C090	C0A0	C0B0	C0C0	C0D0	C0E0	C0F0
Red OFF	C081	C091	C0A1	C0B1	C0C1	C0D1	C0E1	C0F1
Green ON	C082	C092	C0A2	C0B2	C0C2	C0D2	C0E2	C0F2
Green OFF	C083	C093	C0A3	C0B3	C0C3	C0D3	C0E3	C0F3
Blue ON	C084	C094	C0A4	C0B4	C0C4	C0D4	C0E4	C0F4
Blue OFF	C085	C095	C0A5	C0B5	C0C5	C0D5	C0E5	C0F5
80 Col OFF	C086	C096	C0A6	C0B6	C0C6	C0D6	C0E6	C0F6
80 Col ON	C087	C097	C0A7	C0B7	C0C7	C0D7	C0E7	C0F7
Hi-2 OFF	C088	C098	C0A8	C0B8	C0C8	C0D8	C0E8	C0F8
Hi-2 ON	C089	C099	C0A9	C0B9	C0C9	C0D9	C0E9	C0F9
Hi Mono OFF	C08A	C09A	C0AA	C0BA	C0CA	C0DA	C0EA	C0FA
Hi Mono ON	C08B	C09B	C0AB	C0BB	C0CB	C0DB	C0EB	C0FB
Int. OFF	C08C	C09C	C0AC	C0BC	C0CC	C0DC	C0EC	C0FC
Int. ON	C08D	C09D	C0AD	C0BD	C0CD	C0DD	C0ED	C0FD
Spare ON	C08E	C09E	C0AE	C0BE	C0CE	C0DE	C0EE	C0FE
Spare OFF	C08F	C09F	C0AF	C0BF	C0CF	C0DF	C0EF	C0FF

TABLE 3
DVM II Integer Decimal Address

Condition To Set	Expansion Slots							
	0	1	2	3	4	5	6	7
Red ON	- 16256	- 16240	- 16224	- 16208	- 16192	- 16176	- 16160	- 16144
Red OFF	- 16255	- 16239	- 16223	- 16207	- 16191	- 16175	- 16159	- 16143
Green ON	- 16254	- 16238	- 16222	- 16206	- 16190	- 16174	- 16158	- 16142
Green OFF	- 16253	- 16237	- 16221	- 16205	- 16189	- 16173	- 16157	- 16141
Blue ON	- 16252	- 16236	- 16220	- 16204	- 16188	- 16172	- 16156	- 16140
Blue OFF	- 16251	- 16235	- 16219	- 16203	- 16187	- 16171	- 16155	- 16139
80 Col OFF	- 16250	- 16234	- 16218	- 16202	- 16186	- 16170	- 16154	- 16138
80 Col ON	- 16249	- 16233	- 16217	- 16201	- 16185	- 16169	- 16153	- 16137
Hi-2 OFF	- 16248	- 16232	- 16216	- 16200	- 16184	- 16168	- 16152	- 16136
Hi-2 ON	- 16247	- 16231	- 16215	- 16199	- 16183	- 16167	- 16151	- 16135
Hi Mono OFF	- 16246	- 16230	- 16214	- 16198	- 16182	- 16166	- 16150	- 16134
Hi Mono ON	- 16245	- 16229	- 16213	- 16197	- 16181	- 16165	- 16149	- 16133
Int. ON	- 16244	- 16228	- 16212	- 16196	- 16180	- 16164	- 16148	- 16132
Int. OFF	- 16243	- 16227	- 16211	- 16195	- 16179	- 16163	- 16147	- 16131
Spare ON	- 16242	- 16226	- 16210	- 16194	- 16178	- 16162	- 16146	- 16130
Spare OFF	- 16241	- 16225	- 16209	- 16193	- 16177	- 16161	- 16145	- 16129

TABLE 4
DVM II Floating Point Decimal Addresses

Condition To Set	Expansion Slots							
	0	1	2	3	4	5	6	7
Red ON	49280	49296	49312	49328	49344	49360	49376	49392
Red OFF	49281	49297	49313	49329	49345	49361	49377	49393
Green ON	49282	49298	49314	49330	49346	49362	49378	49394
Green OFF	49283	49299	49315	49331	49347	49363	49379	49395
Blue ON	49284	49300	49316	49332	49348	49364	49380	49396
Blue OFF	49285	49301	49317	49333	49349	49365	49381	49397
80 Col OFF	49286	49302	49318	49334	49350	49366	49382	49398
80 Col ON	49287	49303	49319	49335	49351	49367	49383	49399
Hi-2 OFF	49288	49304	49320	49336	49352	49368	49384	49400
Hi-2 ON	49289	49305	49321	49337	49353	49369	49385	49401
Hi Mono OFF	49290	49306	49322	49338	49354	49370	49386	49402
Hi Mono ON	49291	49307	49323	49339	49355	49371	49387	49403
Int. ON	49292	49308	49324	49340	49356	49372	49388	49404
Int. OFF	49293	49309	49325	49341	49357	49373	49389	49405
Spare ON	49294	49310	49326	49342	49358	49374	49390	49406
Spare OFF	49295	49311	49327	49343	49359	49375	49391	49407

TABLE 5
DVM II Integer CP/M Addresses

Condition To Set	Expansion Slots							
	0	1	2	3	4	5	6	7
Red ON	- 8064	- 8048	- 8032	- 8016	- 8000	- 7984	- 7968	- 7952
Red OFF	- 8063	- 8047	- 8031	- 8015	- 7999	- 7983	- 7967	- 7951
Green ON	- 8062	- 8046	- 8030	- 8014	- 7998	- 7982	- 7966	- 7950
Green OFF	- 8061	- 8045	- 8029	- 8013	- 7997	- 7981	- 7965	- 7949
Blue ON	- 8060	- 8044	- 8028	- 8012	- 7996	- 7980	- 7964	- 7948
Blue OFF	- 8059	- 8043	- 8027	- 8011	- 7995	- 7979	- 7963	- 7947
80 Col OFF	- 8058	- 8042	- 8026	- 8010	- 7994	- 7978	- 7962	- 7946
80 Col ON	- 8057	- 8041	- 8025	- 8009	- 7993	- 7977	- 7961	- 7945
Hi-2 OFF	- 8056	- 8040	- 8024	- 8008	- 7992	- 7976	- 7960	- 7944
Hi-2 ON	- 8055	- 8039	- 8023	- 8007	- 7991	- 7975	- 7959	- 7943
Hi Mono OFF	- 8054	- 8038	- 8022	- 8006	- 7990	- 7974	- 7958	- 7942
Hi Mono ON	- 8053	- 8037	- 8021	- 8005	- 7989	- 7973	- 7957	- 7941
Int. ON	- 8052	- 8036	- 8020	- 8004	- 7988	- 7972	- 7956	- 7940
Int. OFF	- 8051	- 8035	- 8019	- 8003	- 7987	- 7971	- 7955	- 7939
Spare ON	- 8050	- 8034	- 8018	- 8002	- 7986	- 7970	- 7954	- 7938
Spare OFF	- 8049	- 8033	- 8017	- 8001	- 7985	- 7969	- 7953	- 7937

3.2 APPENDIX B

Under certain conditions, the 80 column display may contain noise that seems resistant to the normal adjustments on the DVM II and the 80 column card. The DVM II has a switch to allow the option of TTL input from the 80 column board instead of composite. The switch (S1) is at DVM II board coordinants D-8, as shown in Figure 2, in the Installation section. The switch settings are as shown below.

COMPOSITE VIDEO



S1A ON
S1B OFF

TTL VIDEO



S1A OFF
S1B ON

Find the 80 column board in use in Table 6 below and connect the pin on the DVM II indicated in Figure 2 to the IC pin position designated below.

Table 6
80 Column Card Connection Points

80 Col Card	Connection Point
Bit-3	U12 pin 4 (74LS02)
Doublevision	U20 pin 1 (74LS02)
Magnum 80	U16 pin 8 (74LS08)
Smarterm	U16 pin 1 (CRT8002-003)
Smarterm II	Header J5 pin 1
Sup'R'Terminal	U2 pin 3 (7404)
Videx Videoterm	U1 pin 3 (74LS86)
Vision 80	U15 pin pin 9 (74S74)
Wizard-80	U8 pin pin 1 (MPQ 3546)

3.3 APPENDIX C

Background Information On Monitors

RGB Vs. COMPOSITE

A color monitor can be either an RGB monitor, or a composite monitor. RGB stands for Red, Green, and Blue. An RGB monitor uses the color information in three separate signals, red, green, and blue, and writes them to the screen individually. This allows greater color detail and clarity because of the wider band width capability of each RGB signal.

A composite monitor combines all the color information in one "composite" signal. This produces a display that is not as clear (distinct) as the RGB display because of the limited bandwidth of the NTSC composite signal.

DIGITAL Vs. ANALOG

An RGB monitor can have either an analog input or a digital input.

Digital input is TTL (transistor, transistor logic). This means that the individual RGB guns are either on (full saturation) or off. One cannot adjust the levels of one particular color. (The only exception to this is that the entire display can have the intensity cut in half using an intensity bit.) The result is that digital RGB monitors can have a selection of eight colors formed in the following manner:

RED	GREEN	BLUE	RESULTING COLOR
off	off	off	black
on	on	on	white
on	off	off	red
off	on	off	green
off	off	on	blue
on	on	off	yellow
on	off	on	magenta
off	on	on	cyan

Using the intensity bit, the eight colors normally produced can be displayed at half intensity. In other words, red becomes half intense red (pink). Note that half intense black is still black because no guns are on at all.

If the RGB monitor has an analog input this means the level of each color (RGB) can be individually controlled. The result is essentially an infinite number of colors, depending upon the capabilities of your computer.

